# Penetrating Wounds Of The Abdomen

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This study was undertaken in order to review and evaluate our experience with penetrating wounds of the abdomen at Martin Luther King, Jr. General Hospital and to compare our results with those of other trauma centers.[1,2] We are able to collect sufficient data for analysis on 120 of 131 consecutive operative cases. These patients were treated during the 15 month period from March 1972 (hospital opening) to June 1973. The patients ranged in age from seven years to 76 years. Gunshot wounds outnumbered knife wounds 72 to 48, respectively. This incidence follows the national trend of an increasing predominance of gunshot wounds to knife wounds. There were only two gunshot wounds and no high velocity missile wounds during this period of study.

## GUNSHOT WOUNDS

Of the 72 patients with gunshot wounds, 64 were male and eight were female. 53 of the 64 male patients were in the 18-40 group, as were 7 of the eight female patients. The most frequent organs injured were the small bowel (32), colon (31), and liver (29); less frequently injured were the stomach (16), kidney (10), and duodenum (10) (Table 1). There was a high incidence of multiple organ injuries, and 44 major associated injuries—14 of which involved the chest. Fifty-three of the 72 patients had two or more organs injured; 20 had three or more organs injured and, in contrast, four patients had negative abdominal explorations.[3] The most frequent post-operative complications were pulmonary (21), abdominal (19), and septic (15). The overall infection rate was 22%.[4] Early in our experience, we had no established antibiotic protocol. However, during this period, most patients received keflin in combination with another antibiotic in order to provide broad spectrum coverage. In analyzing our septic complications, we looked at the infection rate in relation to the time that antibiotic therapy was instituted.[5] Patients who received antibiotics preoperatively experienced an infection rate of 20%, as compared to a rate of 50% in patients who received antibiotics intra-operatively. Only two of 13 patients in whom antibiotic therapy was initiated post-operatively developed infections—a rate of 15%. This remarkably low incidence of infection is considered to be anomalous and due to selection. During the latter three months of this reported series, we

TABLE 1. INCIDENCE OF ORGANS INJURED BY GUNSHOT WOUNDS

| | |
|---|---|
| Small Bowel | 32 |
| Colon | 31 |
| Liver | 29 |
| Stomach | 16 |
| Kidney | 10 |
| Duodenum | 10 |
| Pancreas | 6 |
| Aorta | 5 |
| Vena Cava | 5 |
| Spleen | 5 |
| Gall Bladder | 3 |
| Urinary Bladder | 2 |
| Diaphragm | 2 |
| Rectum | 1 |
| Ureter | 1 |
| Major Associated Injuries | 44 |
| | (Chest - 14) |

TABLE 2. RESULTS—GUNSHOT WOUNDS

*Duration of Hospitalization (Survivors)*

1. Range/Days

| | No./Pts. |
|---|---|
| 0 - 7 | 9 |
| 8 - 14 | 29 |
| 15 - 21 | 7 |
| Over 21 | 12 |

2. Average Hospitalization—18 days

Mortality

1. Mortality Rate (8/72) 11%
2. Cause of Death
   a. Exsanguination (operative) ..... 5*
   b. Shock/Massive Trauma ..... 3

7/8 Deaths Had 3 or More Organs Injured

*All five had great vessel injuries.

adopted the antibiotic protocol of pre-operative administration of the antibiotic combination of cleocin and gentamycin. It is of particular interest that no patients who received this antibiotic combination developed a post-operative infection.

The average duration of hospitalization for the surviving 64 patients was 18 days; 38 patients were hospitalized 14 days or less. The mortality rate was 11% (8/72). Five patients died intra-operatively from exsanguination secondary to great vessel injuries.[6,7] Seven of these eight patients had three or more organs injured further indicating massive trauma in the non-survivors (Table 2).

## KNIFE WOUNDS

There were 48 patients with knife wounds of the abdomen—37 males and 11 females. Twenty-nine of the males and eight of the female patients were in the 18-40 age group. Sinograms were performed in 19 of the 48 patients.[8,9] The 29 patients that did not have sinograms were explored because of signs and symptoms of intra-peritoneal injury. Sixteen of the 19 sinograms were positive; that is, there was intra-peritoneal entry of the contrast medium. At surgery, only nine of the 19 patients studied had injury to the abdominal viscera which represents a 44% false positive rate. Two of the three patients with negative sinograms were subsequently proved to have intra-peritoneal injuries at laparotomy.[10]

TABLE 3. INCIDENCE OF ORGANS INJURED BY STAB WOUNDS

| | |
|---|---|
| Small Bowel | 9 |
| Liver | 9 |
| Diaphragm | 9 |
| Stomach | 5 |
| Spleen | 5 |
| Colon | 3 |
| Kidney | 2 |
| Duodenum | 1 |
| Gall Bladder | 1 |
| Pancreas | 1 |
| Major Associate Injuries | 4 |

The organs injured in decreasing frequency were the small bowel (9), liver (9), diaphragm (9), stomach (5), and spleen (5) (Table 3). Only four patients had three or more organs injured.

Again, the most frequent complications were abdominal, septic, and pulmonary. The overall infection rate was 4.8% (2/42), and the mortality rate was 2% (1/48). There were no infections in the four patients that were treated with our current antibiotic regimen—cleocin and gentamycin. The lone death occurred in a patient who had three organs injured. He died of severe intra-abdominal and pulmonary septic complications eight weeks post-injury in spite of attempts at surgical intervention, antibiotic, and supportive treatment (Table 4).

The average hospital stay was eight days—23 patients were discharged during the first week.

## DISCUSSION

The violence in urban American is graphically illustrated in this operative series of 120 penetrating wounds of the abdomen treated at Martin Luther King, Jr. General Hospital during the first 15 months of its operation. The victims are disproportionately young black males between the age of 18 and 40.

TABLE 4. RESULTS OF STAB WOUNDS

*Duration of Hospitalization* (Survivors)*

| *1. Range/Days* | *No./Patients* |
|---|---|
| 0 - 7 | 23 |
| 8 - 14 | 17 |
| 14 - 21 | 4 |
| Over 21 | 2 |

2. Average Hospitalization—8 days
Mortality Rate 2% (1/48)

The number of gunshot wounds as compared to knife wounds predominate almost 2 to 1 which is the national trend. This fact further indicates the need for social action to bring about control of possession and use of firearms, particularly handguns.

Although our experience is limited, we feel that our morbidity and mortality rates compare favorable with reported series from more established institutions. Our mortality rate of gunshot wounds of the abdomen was 11%.

The high incidence of major vessel injuries and intra-operative exsanguination point to the need of more effective means of resuscitation in these patients, such as the use of the gravity-suit applied at the scene of injury.[6,7] All of the patients with gunshot wounds of major vessels

that died were admitted to the emergency ward in profound shock. The morbidity and mortality in both gunshot wounds and knife wounds was directly proportional to the severity and number of organs injured.

In the first 12 months of our experience, the incidence of septic abdominal complications was as high as 50% in gunshot wounds. During the latter three months of this reported series, we adopted a pre-operative antibiotic[5] protocol of cleocin and gentamycin that has drastically reduced the incidence of infections. Since the time of this review, our experience with the cleocin and gentamycin protocol has been remarkably successful.

We continue to use the singogram[8,9] as an adjunct to demonstrate peritoneal penetration. It was used in 19 of the 48 stab wounds. It is disturbing that two of the 19 sinograms proved to be false negatives. Fortunately, our policy is to observe most abdominal stab wound victims for a period of 24 to 48 hours; this allowed us to diagnose the two patients with occult injury.[10]

## SUMMARY

We have presented a series of 120 consecutive operative cases of penetrating wounds of the abdomen—72 gunshot wounds and 48 stab wounds. The majority of patients were in the 18 to 40 age group. The infection rate was 22% for gunshot wounds and 4.8% for knife wounds. The mortality rate was 11% (8/72) for gunshot wounds and 2% (1/48) for stab wounds. We continue to use the sinogram as an aid in diagnosing peritoneal penetration, although not to the exclusion of expectant clinical observation. We strongly advocate the pre-operative antibiotic combination of cleocin and gentamycin for the prevention of septic complications.

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*(Editorials, from page 172)*

planning for the delivery of health care to children may well consider adding a M.P.H. degree to their training program. This will be helpful in obtaining higher paying positions at policy making levels (particularly important to the black pediatrician and to the black child).

5. The most potent protective device within the pediatrician's grasp is to constantly monitor the quality of care that is delivered directly to his or her patients and to realize the importance of maintaining wholesome relationships with the child's family. High quality service administered by a dedicated physician at reasonable expense to the family will not be ignored by the consuming public.

*(Book Reviews, from page 186)*

coordinated policy by public health and agricultural authorities to minimize the possibility of inducing broad spectrum resistance. Another important problem is that of maintaining eradication once it has been achieved. Formerly malarious areas now in the maintenance phase have a total population of 770 million. The report gives detailed guidance on the planning and management of vigilance activities to prevent the resumption of malaria transmission. The criteria for registration of malaria eradication are assessed. The chemotherapy of malaria, resistance of the malaria parasite to antimalarial drugs, and the training of professional malaria personnel.